

FORM PTO-1390 (REV 5-93)		U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE	ATTORNEY DOCKET NO. 107348-00179
TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371			DATE: November 9, 2001
			U.S. APPLN. NO. (IF KNOWN, SEE 37 C.F.R. 1.5) 09/926485
INTERNATIONAL APPLICATION NO. PCT/JP00/02521	INTERNATIONAL FILING DATE April 18, 2000	PRIORITY DATE CLAIMED May 10, 1999	
TITLE OF INVENTION: SEALANT-CONTAINING TIRE			
APPLICANT(S) FOR DO/EO/US: Toshio YAMAGIWA (Saitama, Japan)			
<p>1. <input checked="" type="checkbox"/> This is a FIRST submission of items concerning a filing under 35 U.S.C. 371. (THE BASIC FILING FEE IS ATTACHED)</p> <p>2. <input type="checkbox"/> This is a SECOND or SUBSEQUENT submission of items concerning a filing under 35 U.S.C. 371.</p> <p>3. <input type="checkbox"/> This express request to begin national examination procedures [35 U.S.C. 371(f)] at any time rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. 371(b) and PCT Articles 22 and 39(1).</p> <p>4. <input type="checkbox"/> A proper demand for International Preliminary Amendment was made by the 19th month from the earliest claimed priority date.</p> <p>5. <input checked="" type="checkbox"/> A copy of the International Application as filed [35 U.S.C. 371(c)(2)]</p> <p>a. <input checked="" type="checkbox"/> is transmitted herewith (required only if not transmitted by the International Bureau).</p> <p>b. <input type="checkbox"/> has been transmitted by the International Bureau.</p> <p>c. <input type="checkbox"/> is not required, as the application was filed in the United States Receiving Office (RO/US).</p> <p>6. <input checked="" type="checkbox"/> A translation of the International Application into English [35 U.S.C. 371(c)(2)].</p> <p>7. <input type="checkbox"/> Amendments to the claims of the International Application under PCT Article 19 [35 U.S.C. 371(c)(3)]</p> <p>a. <input type="checkbox"/> are transmitted herewith (required only if not transmitted by the International Bureau).</p> <p>b. <input type="checkbox"/> have been transmitted by the International Bureau.</p> <p>c. <input type="checkbox"/> have not been made; however, the time limit for making such amendments has NOT expired.</p> <p>d. <input type="checkbox"/> have not been made and will not be made.</p> <p>8. <input type="checkbox"/> A translation of the amendments to the claims under PCT Article 19 [35 U.S.C. 371(c)(3)].</p> <p>9. <input type="checkbox"/> An oath or declaration of the inventor(s) [35 U.S.C. 371(c)(4)].</p> <p>10. <input type="checkbox"/> A translation of the annexes to the International Preliminary Examination Report under PCT Article 36 [35 U.S.C. 371(c)(5)].</p> <p>Items 11 - 16 below concern other document(s) or information included:</p> <p>11. <input checked="" type="checkbox"/> An Information Disclosure Statement under 37 C.F.R. 1.97 and 1.98; PTO-1449 Form; References (3).</p> <p>12. <input type="checkbox"/> An assignment document for recording. A separate cover sheet in compliance with 37 C.F.R. 3.28 and 3.31 is included.</p> <p>13. <input checked="" type="checkbox"/> A FIRST preliminary amendment.</p> <p><input type="checkbox"/> A SECOND or SUBSEQUENT preliminary amendment.</p> <p>14. <input type="checkbox"/> A substitute specification.</p> <p>15. <input type="checkbox"/> A change of power of attorney and/or address letter.</p> <p>16. <input checked="" type="checkbox"/> Other items or information: Drawings (Figs. 1 - 3, 3 sheets); Japanese and English Language PCT Request Form; Japanese and English Language International Search Report (PCT/ISA/210); Japanese and English Language International Preliminary Examination Request (PCT/IPEA/401); Japanese and English Language Response Reply to PCT Opinion; Japanese and English Language International Preliminary Examination Report (PCT/IPEA/409)</p>			

U.S. APPLN. NO. (IF KNOWN, SEE 37 C.F.R. 1.50) 09/926485	INTERNATIONAL APPLICATION NO. PCT/JP00/02521	ATTORNEY DOCKET NO. 107348-00179 DATE: November 9, 2001
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17. ☒ The following fees are submitted:

Basic National Fee [37 C.F.R. 1.492(a)(1)-(5)]:

Search Report has been prepared by the EPO or JPO.....\$890.00

International preliminary examination fee paid to USPTO
 (37 C.F.R. 1.482).....\$710.00

No international preliminary examination fee paid to USPTO
 (37 C.F.R. 1.482) but international search fee paid to USPTO
 [37 C.F.R. 1.445(a)(2)].....\$740.00

Neither international preliminary examination fee
 (37 C.F.R. 1.482) or international search fee
 [37 C.F.R. 1.445(a)(2)] paid to USPTO.....\$1,040.00

International preliminary examination fee paid to USPTO
 (37 C.F.R. 1.482) and all claims satisfied provisions of
 PCT Article 33(2)-(4).....\$ 100.00

ENTER APPROPRIATE BASIC FEE AMOUNT =				\$ 890.00	
Surcharge of \$130.00 for furnishing the oath or declaration later than <input type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date [37 C.F.R. 1.492(e)].				\$	
Claims	Number Filed	Number Extra	Rate		
Total Claims	1 - 20 =	0	X \$ 18.00	\$ 0	
Independent Claims	1 - 3 =	0	X \$ 80.00	\$ 0	
Multiple dependent claim(s) (if applicable)			+ \$270.00	\$ 890.00	
TOTAL OF ABOVE CALCULATIONS =				\$ 890.00	
Reduction by one-half for filing by small entity, if applicable. Verified Small Entity statement must also be filed. (Note 37 C.F.R. 1.9, 1.27, 1.28).				\$	
SUBTOTAL =				\$ 890.00	
Processing fee of \$130.00 for furnishing the English translation later the <input type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date [37 C.F.R. 1.492(f)].				\$	
TOTAL NATIONAL FEE =				\$ 890.00	
Fee for recording the enclosed assignment [37 C.F.R. 1.21(h)]. The assignment must be accompanied by an appropriate cover sheet (37 C.F.R. 3.28, 3.31). \$40.00 per property				\$	
TOTAL FEES ENCLOSED =				\$ 890.00	
				Amount to be refunded	\$
				Charged	\$

a. ☒ Check # 329228 in the amount of \$ 890.00 to cover the above fees is enclosed.

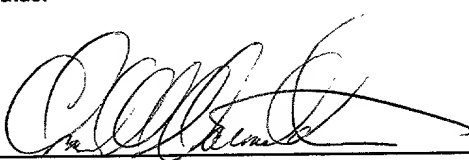
b. ☐ Please charge my Deposit Account No. 01-2300 in the amount of \$ _____ to cover the above fee.
 A duplicate copy of this sheet is enclosed.

c. ☒ The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to
 Deposit Account No. 01-2300.

NOTE: Where an appropriate time limit under 37 C.F.R. 1.494 or 1.495 has not been met, a petition to revive [37 C.F.R. 1.137(a) or (b)]
 must be filed and granted to restore the application to pending status.

SEND ALL CORRESPONDENCE TO:

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CMM:mmg

09/926485

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of:

Toshio YAMAGIWA

Serial No.: New Application

Filed: November 9, 2001

For: SEALANT-CONTAINING TIRE

Group Art Unit:

Examiner:

Atty. Docket No.: 107348-00179

PRELIMINARY AMENDMENT

Commissioner for Patents
Washington, D.C. 20231

November 9, 2001

Sir:

Prior to examination of this application, please amend the above-identified application as follows:

IN THE SPECIFICATION:

Please amend the specification as follows:

Page 2, third paragraph:

-- FIG. 1, FIG. 2A and 2B show an embodiment of the present invention, where FIG. 1 is a lateral cross-section of a wheel mounted with a sealant-containing tire and FIGS. 2A and 2B are views illustrating the operation when the sealant-containing tire has a puncture. FIG. 3 shows a prior art punctured sealant-containing tire. --

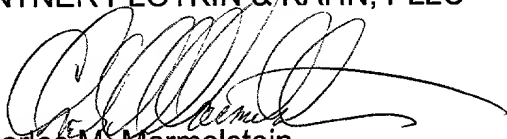
REMARKS

The above amendments to the specification have been made in order to place the Brief Description of the Drawings in the specification into conformance with the drawings being filed with the application. As required under 37 C.F.R. 1.121, as amended, the above-amendment is a clean copy containing the amendments to the specification. Attached to this response, is a marked-up copy of the affected part of the specification showing exactly where the changes are being made.

In the event that any fees are due in connection with this paper, please charge our Deposit Account No. 01-2300.

Respectfully submitted,

ARENT FOX KINTNER PLOTKIN & KAHN, PLLC



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Enclosure: Marked-up Copy of Page 2

In order to achieve the aforementioned object, there is proposed a sealant-containing tire with an annular sealant chamber filled with sealant formed at an inner surface of a tread of a tire body, and with the sealant chamber and an air chamber being partitioned by a partition. The partition is formed of a material of a 300% modulus of 60kgf/cm² or less.

According to this configuration, by making the partition defining the air chamber and the sealant chamber of flexible material of a 300% modulus of 60kgf/cm² or less, not only are punctures caused by nails etc. made smaller, but the punctures are rapidly made smaller after withdrawal of a nail etc. so that the flowing out of air from the air chamber is delayed. The flexible partition can easily be deformed by the air pressure within the air chamber and the sealant within the sealant chamber is therefore rapidly pushed into a puncture of the tread so that a puncture can effectively be repaired.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1, FIG. 2A and FIG. 2B show an embodiment of the present invention, where FIG. 1 is a lateral cross-section of a wheel mounted with a sealant-containing tire and FIGS. 2A and 2B are views illustrating the operation when the sealant-containing tire has a puncture. FIG. 3 ~~shows~~ *shows a prior art punctured sealant-containing tire.*

BEST MODE FOR CARRYING OUT THE INVENTION

The following is a description of practical examples of the present invention based on embodiments of the present invention shown in the appended drawings.

FIG. 1, FIG. 2A and FIG. 2B show an embodiment of the present invention.

As shown in FIG. 1, a tubeless tire T comprising a tire body 1, an outer liner 2 fastened by vulcanization to the inner part of the tire body 1, and an inner liner 3 are mounted on a motorcycle wheel rim R. The outer liner 2 is fastened by vulcanization to the inner surface of a tread 4 of the tire body 1 and the left and right ends of the inner liner 3 excluding the central part are fastened by vulcanization to the inner surfaces of

SPECIFICATION

SEALANT-CONTAINING TIRE

FIELD OF THE INVENTION

The present invention relates to a sealant-containing tire with an annular sealant chamber filled with sealant formed at an inner surface of a tread of a tire body, and with the sealant chamber and an air chamber being partitioned by a partition.

BACKGROUND ART

Sealant-containing tires such as disclosed in Japanese Patent Application Laid-open No. 8-323875, where a sealant chamber at least partially defined by a liner is formed at an inner surface of a tread of a tire body so that punctures in the tread caused by nails etc. are automatically sealed by sealant contained within the sealant chamber so as to delay the leaking of air from the puncture are well known.

FIG. 3 shows the situation for a related sealant-containing tire when a puncture caused by a nail etc. penetrates a tread 4, sealant chamber 7 and liner 3 so as to reach an air chamber 8. Because the rubber of the tread 4 is hard, after the nail etc. is removed, little contraction (refer to the arrows) of the puncture 4_1 due to the elasticity of the rubber is anticipated. Contraction of a puncture 3_1 (refer to the arrows) after removal of the nail etc. is also slight because the rubber of the liner 3 in related sealant-containing tires is relatively hard. Air within the air chamber 8 therefore flows to the outside in a forceful manner through the puncture 3_1 in the liner 3 and the puncture 4_1 in the tread 4 and repair of the puncture 4_1 in the tread 4 by the sealant 6 with which the sealant chamber 7 is filled can therefore not be carried out in an effective manner.

DISCLOSURE OF THE INVENTION

In order to resolve the aforementioned situation, it is the object of the present invention to increase the effectiveness of repairing a puncture with sealant in a sealant-containing tire in order to delay the flowing out of air from an air chamber.

In order to achieve the aforementioned object, there is proposed a sealant-containing tire with an annular sealant chamber filled with sealant formed at an inner surface of a tread of a tire body, and with the sealant chamber and an air chamber being partitioned by a partition. The partition is formed of a material of a 300% modulus of 60kgf/cm² or less.

According to this configuration, by making the partition defining the air chamber and the sealant chamber of flexible material of a 300% modulus of 60kgf/cm² or less, not only are punctures caused by nails etc. made smaller, but the punctures are rapidly made smaller after withdrawal of a nail etc. so that the flowing out of air from the air chamber is delayed. The flexible partition can easily be deformed by the air pressure within the air chamber and the sealant within the sealant chamber is therefore rapidly pushed into a puncture of the tread so that a puncture can effectively be repaired.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1, FIG. 2A and FIG. 2B show an embodiment of the present invention, where FIG. 1 is a lateral cross-section of a wheel mounted with a sealant-containing tire and FIGS. 2A and 2B are views illustrating the operation when the sealant-containing tire has a puncture.

BEST MODE FOR CARRYING OUT THE INVENTION

The following is a description of practical examples of the present invention based on embodiments of the present invention shown in the appended drawings.

FIG. 1, FIG. 2A and FIG. 2B show an embodiment of the present invention.

As shown in FIG. 1, a tubeless tire T comprising a tire body 1, an outer liner 2 fastened by vulcanization to the inner part of the tire body 1, and an inner liner 3 are mounted on a motorcycle wheel rim R. The outer liner 2 is fastened by vulcanization to the inner surface of a tread 4 of the tire body 1 and the left and right ends of the inner liner 3 excluding the central part are fastened by vulcanization to the inner surfaces of

left and right side walls 5, 5 of the tire body 1. A sealant chamber 7 substantially arc-shaped in cross-section that is filled with sealant 6 is defined between the central part of the inner liner 3 and the outer liner 2 and an air chamber 8 substantially circular in cross-section is defined within the inner liner 3.

The inner liner 3 partitioning the sealant chamber 7 and the air chamber 8 forms the partition of the present invention and is therefore composed of butyl rubber (IIR) of a 300% modulus of 60kgf/cm² or less. The 300% modulus indicates the magnitude of tensile stress when a material is extended to 300%, with materials having a smaller 300% modulus being more flexible.

The rim R is equipped with an annular rim body 9 extending in a circumferential direction of the tire T, and a pair of flanges 10, 10, extending radially outwards in a widthwise direction from both ends of the rim body 9, for supporting the inner periphery of the tire body 1. An air valve 11 for filling the air chamber 8 with air is supported so as to pass through an air valve attachment section 12 formed at one location in the circumferential direction of the rim body 9.

After the nail N penetrating the tread 4 of the tire body 1, outer liner 2 and inner liner 3 as shown in FIG. 2A is withdrawn, punctures 4₁, 2₁, and 3₁ are formed in the tread 4, the outer liner 2 and the inner liner 3, respectively, as shown in FIG. 2B.

The puncture 4₁ only contracts slightly after the nail N is pulled out because the tread 4 of the tire body 1 is formed of resilient rubber. The rubber of the outer liner 2 is flexible compared to the rubber of the tread 4, but the outer liner 2 is thin and is fastened to the inner surface of the tread 4 so as to be integrally formed with the tread 4. The puncture 2₁ in the outer liner 2 therefore also only contracts slightly after removal of the nail N. On the other hand, because the inner liner 3 is made of flexible rubber of a 300% modulus of 60kgf/cm² or less, the puncture 3₁ rapidly contracts after the nail N is withdrawn so as to be of a diameter substantially smaller than the diameter of the nail

N.

When the puncture 3_1 in the inner liner 3 contracts, it becomes difficult for the air within the air chamber 8 to pass through the puncture 3_1 , and the amount of air that flows to the outside of the tire body 1 through the punctures 2_1 and 4_1 in the outer liner 2 and the tread 4 is reduced. Further, because the inner liner 3 is flexible, the inner liner 3 can be easily deformed by the air pressure within the air chamber 8 so that the volume of the sealant chamber 7 is therefore reduced. Sealant 6 pushed out from the sealant chamber 7 therefore fills the punctures 2_1 and 4_1 in the outer liner 2 and the tread 4 and the punctures 2_1 and 4_1 are therefore effectively repaired.

[Table 1]

	Puncture Diameter (Pin Diameter; 3mm)	Puncture Diameter (Pin Diameter; 5mm)
Comparative Example	2.0 mm	2.0 to 3.0 mm
Embodiment	1.5 mm	1.5 to 2.0 mm

Table 1 shows measurements of the diameter of punctures formed in the inner liner 3 when a tire (comparative example) fitted with an inner liner 3 of a 300% modulus exceeding 60kgf/cm^2 and a tire (embodiment) fitted with an inner liner 3 of a 300% modulus of 60kgf/cm^2 or less are pierced by two types of pins for nails of diameters of 3mm and 5mm. It can therefore be understood that the diameter of the puncture is reduced with the embodiment fitted with an inner liner 3 of flexible rubber of a 300% modulus of 60kgf/cm^2 or less, compared with the comparative example.

[Table 2]

	Comparative Example 1	Comparative Example 2	Example 1	Example 2
300% Modulus (kgf/cm ²)	100	80	60	40
Extension at Time of Rupture (%)	300	450	550	650
Tensile Stress at time of Rupture (kgf/cm ²)	100	150	120	100
Pin Diameter; 2 mm	O	O	O	O
Pin Diameter; 3 mm	Δ	O	O	O
Pin Diameter; 4 mm	X	Δ	O	O
Pin Diameter; 5 mm	X	X	O	O
Pin Diameter; 6 mm	X	X	Δ	O
Pin Diameter; 7 mm	X	X	X	Δ

O; Air leakage stopped rapidly.

Δ; Air leakage stopped in stages.

X; Air leakage not stopped.

Table 2 shows investigation of the extent to which air leaks from the air chamber 8 when punctures are made in tires with pins acting as nails of various diameters. In comparative example 1, a liner (of a 300% modulus of 100kgf/cm²) for preventing air from passing is fastened to the inner surface of a tire body of a typical tubeless tire that does not contain sealant. In comparative example 2, an inner liner 3 of a 300% modulus of 80kgf/cm² is fastened to a tire of the structure shown in FIG. 1. In embodiments 1 and 2, inner liners 3 of 300% moduli of 60kgf/cm² and 40kgf/cm², respectively, are fastened to the tire of the structure of FIG. 1.

As becomes clear from Table 2, the effectiveness of preventing the leaking of air is improved as the 300% modulus is reduced, i.e. as the rubber of the inner liner 3 becomes more flexible, so that leaking of air can be effectively prevented even if the diameter of the pin causing the puncture is increased. This effectiveness is particularly striking for examples 1 and 2 where the 300% modulus is 60kgf/cm² or less.

The embodiment of the present invention has been described above but various design modifications are possible without deviating from the spirit of the present invention.

For example, with the tire T of this embodiment, the outer liner 2 is fastened to the inner surface of the tread 4 of the tire body 1, but the present invention can also be applied to a tire T that does not have an outer liner 2. Further, the material for the inner liner 3 is by no means limited to butyl rubber (IIR).

INDUSTRIAL APPLICABILITY

As is apparent from the above, the sealant-containing tire according to the present invention is applicable to a two-wheeled motor vehicle and further to other types of vehicles, e.g., a bus, a truck or an automobile.

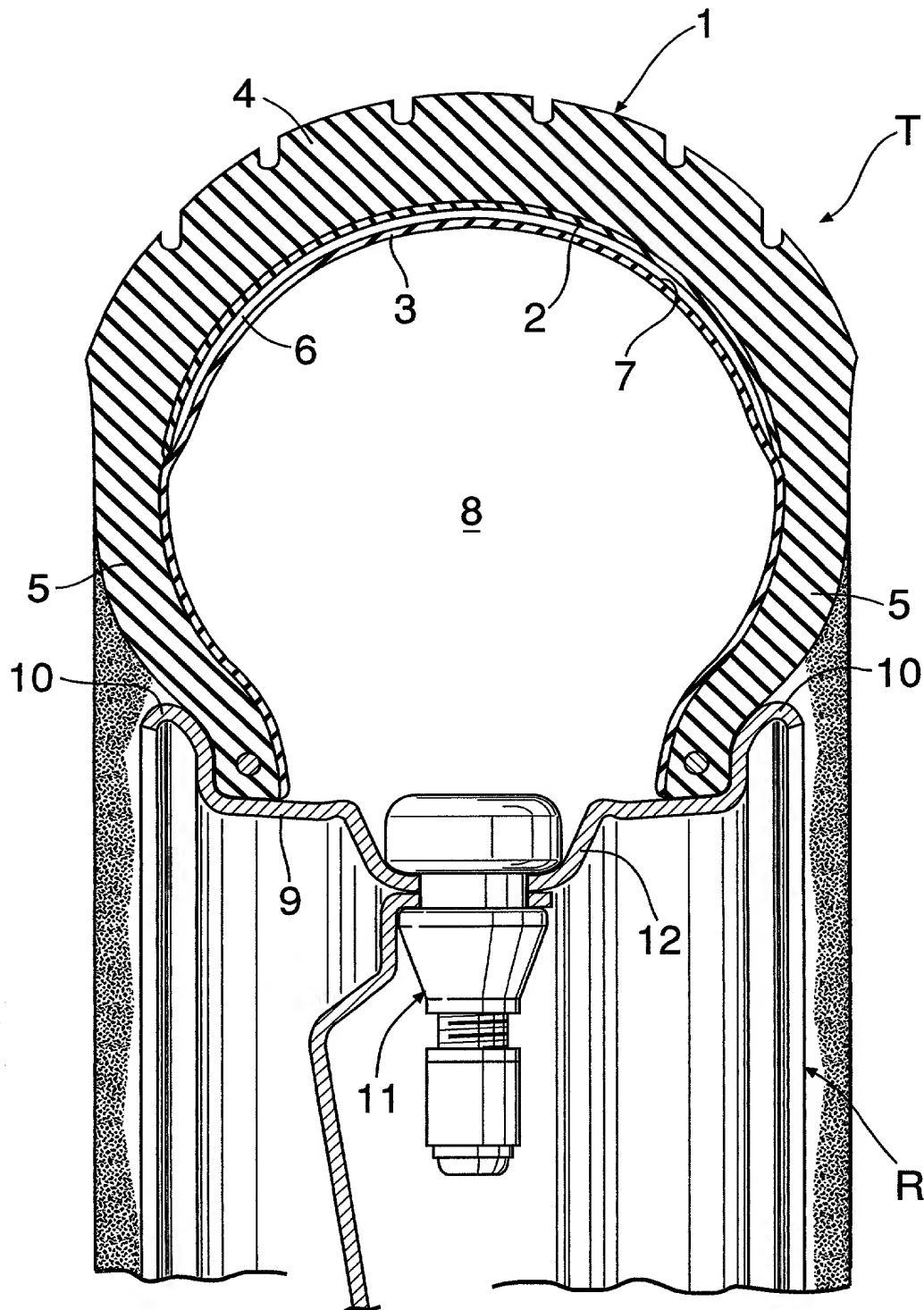
WHAT IS CLAIMED IS

1. A sealant-containing tire with an annular sealant chamber (7) filled with sealant (6) formed at an inner surface of a tread (4) of a tire body (1), and with the sealant chamber (7) and an air chamber (8) being partitioned by a partition (3),

characterized in that the partition (3) is formed of a material of a 300% modulus of 60kgf/cm² or less.

1/3

FIG.1



2/3

FIG.2A

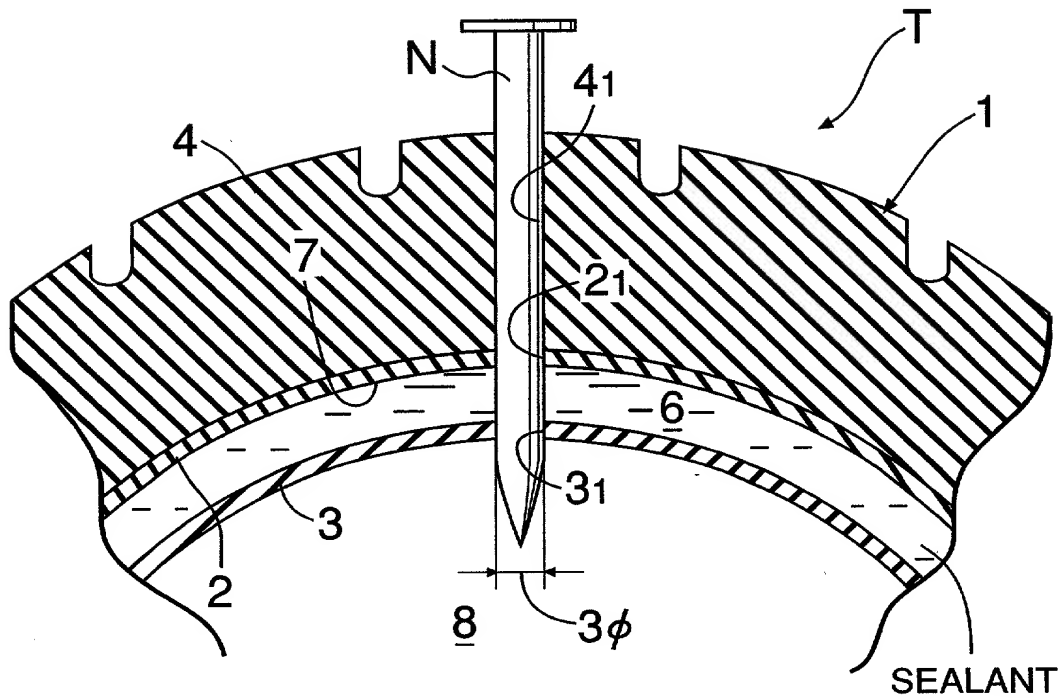
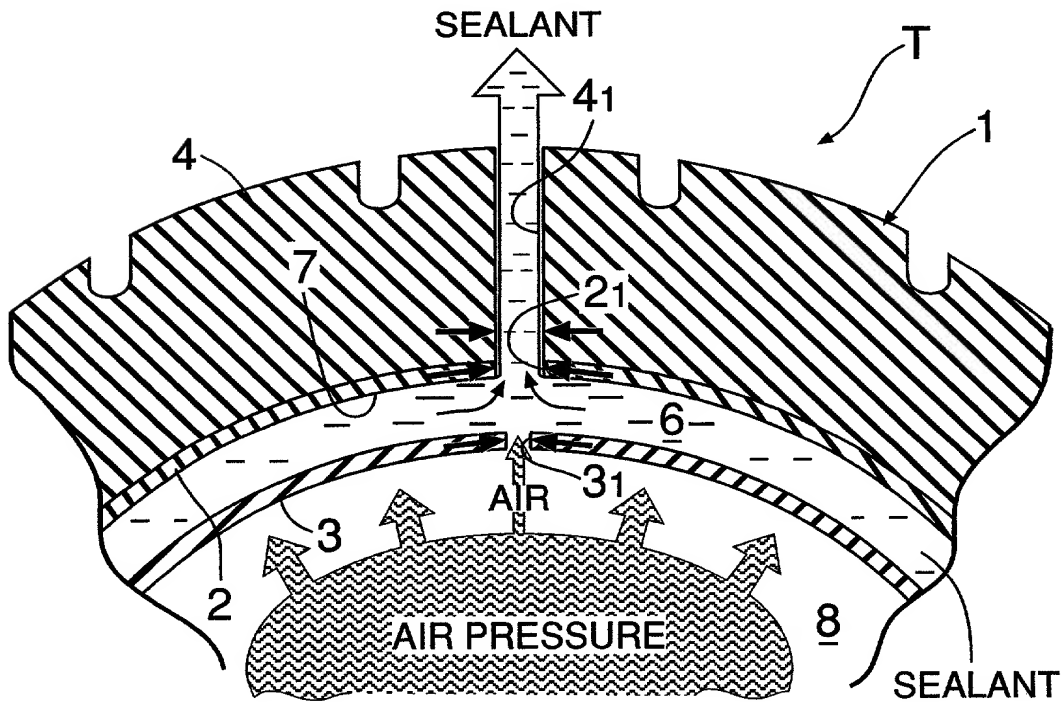


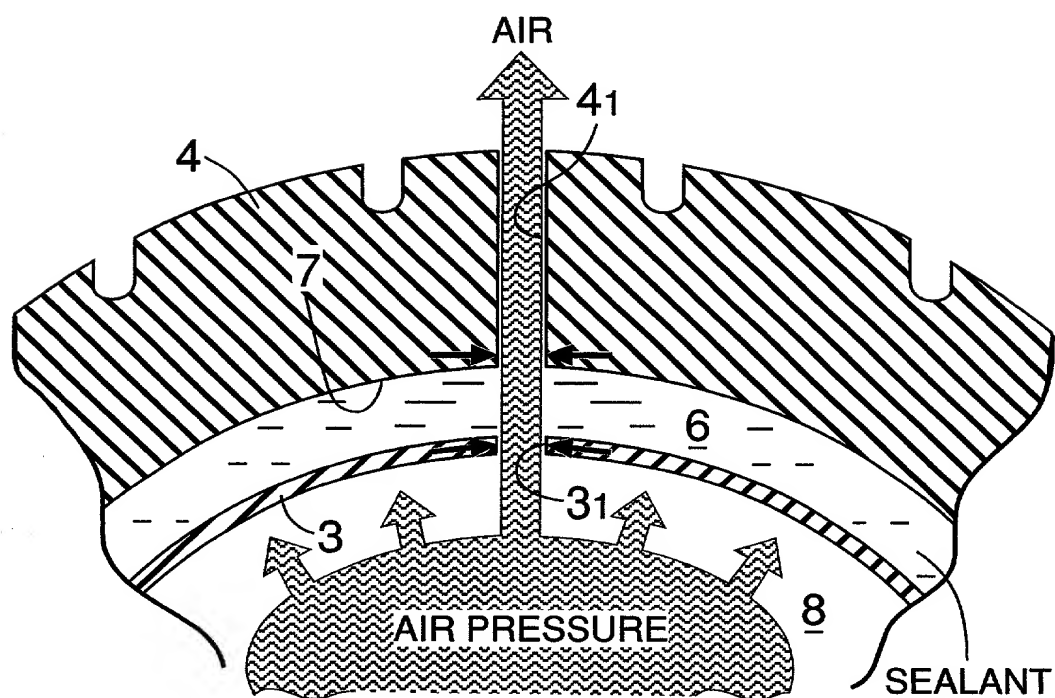
FIG.2B



3/3

FIG.3

(PRIOR ART)



Declaration For U.S. Patent Application

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below my name.

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled

(Insert Title)

SEALANT-CONTAINING TIRE

the specification of which is attached hereto unless the following box is checked:

☒ was filed on April 18, 2000 as PCT International Application Number PCT/IP00/02521
 and was amended on _____ and/or
 was filed on November 9, 2001 as United States Application Number 09/926,485
 and was amended on November 9, 2001.

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claim(s), as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to patentability as defined in 37 C.F.R. §1.56.

I hereby claim foreign priority benefits under 35 U.S.C. §119(a)-(d) or §365(b) of any foreign application(s) for patent or inventor's certificate, or §365(a) of any PCT International application which designates at least one country other than the United States, listed below and have also identified below any foreign application(s) for patent or inventor's certificate or PCT International Application having a filing date before that of the application for which priority is claimed:

(List prior foreign applications)	<u>11-128863</u> (Number)	<u>Japan</u> (Country)	<u>10 / May / 1999</u> (Day/Month/Year Filed)	Priority Claimed <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
	_____ (Number)	_____ (Country)	_____ (Day/Month/Year Filed)	<input type="checkbox"/> Yes <input type="checkbox"/> No
	_____ (Number)	_____ (Country)	_____ (Day/Month/Year Filed)	<input type="checkbox"/> Yes <input type="checkbox"/> No

I hereby claim the benefit under 35 U.S.C. §119(e) of any United States provisional application(s) listed below.

_____ (Application Number)	_____ (Filing Date)
_____ (Application Number)	_____ (Filing Date)

☐ See attached list for additional prior foreign or provisional applications.

I hereby claim the benefit under 35 U.S.C. §120 of any United States application(s) or §365(c) of any PCT International application(s) designating the United States of America listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior application(s) (U.S. or PCT) in the manner provided by the first paragraph of 35 U.S.C. §112, I acknowledge the duty to disclose information which is material to patentability as defined in 37 C.F.R. §1.56 which became available between the filing date of the prior application(s) and the national or PCT International filing date of this application:

(List prior U.S. Applications or PCT International applications designating the U.S.)	_____ (Application Serial No.)	_____ (Filing Date)	_____ (Status) (patented, pending, abandoned)
	_____ (Application Serial No.)	_____ (Filing Date)	_____ (Status) (patented, pending, abandoned)

And I hereby appoint the firm of Arent Fox, Customer Number 004372 including as principal attorneys: Robert B. Murray, Reg. No. 22,980; Charles M. Marmelstein, Reg. No. 25,895; George E. Oram, Jr., Reg. No. 27,931; Douglas H. Goldhush, Reg. No. 33,125; Richard J. Berman, Reg. No. 39,107; King L. Wong, Reg. No. 37,500; James A. Poulos, III, Reg. No. 31,714; Murat Ozgu, Reg. No. 44,275; Robert K. Carpenter, Reg. No. 34,794; Gregory B. Kang, Reg. No. 45,273; Rustan J. Hill, Reg. No. 37,351; Carl Schaukowitch, Reg. No. 29,211; Kevin Turner, Reg. No. 43,437; Rhonda C. Barton, Reg. No. P47,271; Hans J. Crosby, Reg. No. 44,634; David D. Dzara, Reg. No. 47,543; Lynne D. Anderson, Reg. No. 46,412; and Laurence J. Edson, Reg. No. 44,666.

Please direct all communications to the following address:

Customer No. 004372
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 Washington, D.C. 20036-5339
 Telephone No. (202) 638-5000 Facsimile No. (202) 638-4810

The undersigned hereby authorizes the U.S. attorneys named herein to accept and follow instructions from the undersigned's assignee, if any, and/or, if the undersigned is not a resident of the United States, the undersigned's domestic attorney, patent attorney or patent agent, as to any action to be taken in the Patent and Trademark Office regarding this application without direct communication between the U.S. attorneys and the undersigned. In the event of a change in the person(s) from whom instructions may be taken, the U.S. attorneys named herein will be so notified by the undersigned.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

1-00
Full name of sole or first inventor Toshio YAMAGIWA
Inventor's signature Toshio Yamagiwa December 20, 2001
Residence Wako-shi, Saitama, Japan TPX Date
Citizenship Japan
Post Office Address c/o Kabushiki Kaisha Honda Gijutsu Kenkyusho, 4-1, Chuo 1-chome, Wako-shi,
Saitama, Japan

Full name of second joint inventor, if any _____

Inventor's signature _____ Date _____

Residence _____

Citizenship _____

Post Office Address _____

Full name of third joint inventor, if any _____

Inventor's signature _____ Date _____

Residence _____

Citizenship _____

Post Office Address _____

Full name of fourth joint inventor, if any _____

Inventor's signature _____ Date _____

Residence _____

Citizenship _____

Post Office Address _____

Full name of fifth joint inventor, if any _____

Inventor's signature _____ Date _____

Residence _____

Citizenship _____

Post Office Address _____

Full name of sixth joint inventor, if any _____

Inventor's signature _____ Date _____

Residence _____

Citizenship _____

Post Office Address _____

Full name of seventh joint inventor, if any _____

Inventor's signature _____ Date _____

Residence _____

Citizenship _____

Post Office Address _____